

the electrodeposition reaction [2]. Despite the numerous studies on Cu superconformal electrodeposition the precise influence of the additive on the elementary steps of this deposition reaction is largely not understood, mostly due to the difficulty in making direct experimental observations of the growth mechanisms on the atomic scale. In-situ Surface X-Ray Diffraction (SXRD) offers unique possibilities to study the electrochemical processes under the film and could provide first direct data on the atomic-scale growth mechanism under these conditions. SXRD experiments revealed on Cu(001) in PEG containing electrolyte the existence of an ordered Cl- adlayer underneath the inhibiting film. Moreover we found evidence for a pronounced kinetic limitation for the formation of this adlayer structure.

References: [1] P.C. Andricacos, et al., *Electroch. Microf.* 42, 567 (1998) [2] P.M. Vereecken, R.A. Binstead, H Deligianni, P.C. Andricacos, *IBM J. Res. Develop.* 49, 3 (2005)

O 39.9 Wed 17:00 SCH A315

Variation of the electrode potential with elastic strain — ●MAXIM SMETANIN¹, DOMINIK KRAMER¹, SENTHILNATHAN MOHANAN², ULRICH HERR², and JOERG WEISSMUELLER^{1,3} — ¹Forschungszentrum Karlsruhe, Institut für Nanotechnologie, Karlsruhe — ²Universität Ulm, Institut für Mikro- und Nanomaterialien, Ulm — ³Universität des Saarlandes, Technische Physik, Saarbrücken

A fundamental parameter in electrochemistry, the electrode potential, E , is intricately related to the solids Fermi energy and to its work function in vacuum. How does E at the metal-electrolyte interface vary when the electrode is subjected to an elastic tangential deformation with strain ϵ ? This is of interest in relation to strain effects on the metals band structure, which can affect catalytic processes, to corrosion science, and to recent attempts to understand the response of the surface stress, f , of metals to changes in the superficial charge density, q . The connection to surface stress rests on a Maxwell re-

lation, $df/dq=dE/de$. While the left-hand-side has been studied in several experiments, we know of no quantitative experiment exploring the right-hand side. Our approach is to use a small cyclic strain of a thin-film gold electrode along with sensitive potential monitoring. We found that the potential varies linearly with the strain; the response parameter is negative. In 10 mM HClO₄, for quasi-static straining $dE/de=-1$ V, whereas the value converges to -1.8 V at frequencies around 100Hz. The sign agrees with early predictions, the magnitude is in good agreement with recent results from density functional theory for Au(111) in vacuum and with experimental results for df/dq in electrolyte.

O 39.10 Wed 17:15 SCH A315

Influence of anions on dealloying of Cu₃Au (111): An in-situ x-ray study — ●APARNA PAREEK, GENESIS ANKAH, SASCHA HÜMANN, MICHAEL ROHWERDER, and FRANK RENNER — Max-Planck Institut für Eisenforschung, Max-Planck Strasse 1, 40237 Düsseldorf

Dealloying is a well-known process occurring at the alloy surfaces, which are composed of elements with widely different Nernst potentials. The dealloying behaviour of Cu₃Au in 0.1M H₂SO₄ was previously investigated using electrochemical measurements combined with in-situ X-ray diffraction. We reported the formation of an ultra-thin epitaxial passive Au layer at lower overpotentials with a reversed stacking sequence, which transforms to thicker Au islands at higher overpotentials. Here we investigated the influence of various anionic species (Br, I) dissolved in 0.1M H₂SO₄ on the above electrochemical corrosion process. Presence of these anionic additives influences the potential where the ultra-thin passive layer transforms to the thicker Au islands. To corroborate the results obtained from X-ray measurements, ex-situ AFM measurements were performed, where the topographical changes with the potential change were recorded. In addition, we present first results of high resolution TEM studies.

O 40: Methods: Scanning probe techniques I

Time: Wednesday 15:00–17:30

Location: SCH A316

O 40.1 Wed 15:00 SCH A316

Detection of charges using scanning force microscopy in contact mode* — ●FLORIAN JOHANN, AKOS HOFFMANN, and ELISABETH SOERTEL — Institute of Physics, University of Bonn, Wegelerstr. 8, 53115 Bonn, Germany

Electrostatic force microscopy is the standard technique to detect surface charges using a scanning force microscope (SFM). Therefore the SFM is operated in non-contact mode with an alternating voltage applied to the tip. The electrostatic interaction between the tip and the charges to be measured lead to oscillations of the cantilever that can be read-out using a lock-in amplifier. Now, operating the SFM in contact-mode results in the same electrostatic interaction between tip and surface charges. However, in this case, the tip can not move freely due to its being in contact with the sample surface. To still allow for charge detection in contact-mode, e.g. a deformation of the sample surface underneath the tip caused by the electrostatic forces must occur. To reveal the limits of charge detection in contact-mode SFM we performed a detailed analysis of the relevant parameters such as cantilever stiffness, tip load, and elastic properties of the sample.

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O 40.2 Wed 15:15 SCH A316

Investigation of isolated single molecules on an insulating substrate — ●KNUD LÄMMLE¹, ALEXANDER SCHWARZ¹, MARC PROSENC², and ROLAND WIESENDANGER¹ — ¹Universität Hamburg - Institut für Angewandte Physik, Jungiusstrasse 11a, 20355 Hamburg — ²Universität Hamburg - Department Chemie, Martin-Luther-King Platz 6, 20146 Hamburg

To tailor new molecular based devices, it is important to understand the characteristic features of their building blocks, i.e., the properties of individual molecules. Here, we utilized non-contact atomic force microscopy (NC-AFM) to study isolated Co-Salen molecules on NaCl(001). On this large band-gap insulator hybridization effects, which strongly alter the properties of molecules if adsorbed on metallic surfaces, are eliminated.

Immobilization of the rather small molecule is achieved by evaporat-

ing them *in situ* onto a 20 K cold substrate and by performing subsequent measurements at 8.2 K. NC-AFM images acquired on wide terraces reveal randomly distributed isolated banana-shaped objects with long and short axis of about 1.5 and 0.6 nm, respectively. By comparison with the known structure of the molecule, they can be identified as individual molecules adsorbed in a planar configuration. Surprisingly, the bananas appear asymmetric, i.e., the 60 pm high maximum is considerably shifted away from the center. Details of the orientation with respect to the underlying substrate as well as the exact adsorption site will be discussed by evaluating images, were isolated molecules and atomic resolution on the substrate are visible simultaneously.

O 40.3 Wed 15:30 SCH A316

High Resolution 3D-Force-Field-Spectroscopy on Fe/W(001) — ●RENE SCHMIDT, CESAR LAZO, UWE KAISER, ALEXANDER SCHWARZ, STEFAN HEINZE, and ROLAND WIESENDANGER — Institut für Angewandte Physik, Universität Hamburg

Three-dimensional force fields with atomic resolution have been measured by atomic force microscopy in the non-contact regime (NC-AFM) in ultrahigh vacuum and at low temperatures. Force spectroscopy allows a site specific determination of the distance dependence of tip and sample interaction potential and force on the investigated system. Here, we study a purely metallic system, i.e., the iron monolayer epitaxially grown on a W(001) substrate with a metallic tip.

The high resolution data consists of 128×128 curves on a 2 nm×2 nm surface area. The curves were recorded in a distance range of 270 pm close to the surface with Δz -steps of 10 pm. Additionally, one single curve was recorded up to a distance of 20 nm to determine the long-range tip-sample forces. The resulting total force at each lattice site can be separated into long- and short-range contributions. The experimentally obtained short-range forces are compared quantitatively with first principles calculations based on density functional theory.

O 40.4 Wed 15:45 SCH A316

3D-Force-Spectroscopy and -Dissipation Data of an Organic-Inorganic Interface: PTCDA on Ag(111) — ●DANIEL-ALEXANDER BRAUN, GERNOT LANGEWISCH, HARALD FUCHS, and ANDRE SCHIRMEISEN — CeNTech (Center for Nanotechnology) & Institute